TITLE: METHOD AND MEANS OF SEALING AN ELECTRICAL CONDUCTOR THROUGH THE HOUSING OF A FLUID FILLED MOTOR

BACKGROUND OF THE INVENTION

The present invention relates to electrical conductors and, more specifically, to electrical conductors for fluid filled motors.

Electrical motors used to power heavy machinery and other hydraulic systems oftentimes are flooded or cooled with the hydraulic fluid or similar oil. In some instances, the electrical motors are completely submerged in the hydraulic fluid for increased heat transfer as well as space conservation. Because of this, the components of electrical motors typically are enclosed in a leakproof housing. As such, it is necessary to provide a means for connecting the electrical wires that provide power to the motor through the housing while sealing against leakage of the hydraulic fluid through this connection. Further, as the housing typically is made of metal or other conductive materials, it is necessary to insulate the electrical connections from the housing.

U.S. Pat. No. 3,850,501 to Butterfield et al. discloses a feedthrough electrical terminal for use in a liquid cooled shaft. Butterfield et al. accomplishes a leakproof and insulated connection through the use of non-metallic bushings and washers compressed by a threaded female terminal member. The disadvantage Butterfield et al. is that such a design requires numerous components, many of which are non-standard and must be custom machined.

U.S. Pat. Nos. 4,822,473 to Arnesen and 6,657,336 to Morikaku et al. both disclose electrical connectors that are

comprised of standard pieces of hardware. Specifically, both of these patents disclose the use of standard terminal bolts as conductors. Morikaku et al. also discloses the use of insulating elements to protect the terminal bolt conductor from the metallic housing. The disadvantage of both of these designs is that they are both susceptible to leakage. As such, Arnesen and Morikaku et al. would not be useful in the specific application of a fluid filled motor.

U.S. Pat. No. 4,614,397 to Flanigan discloses a terminal plate assembly that teaches the use of a terminal bolt as a conductor. Further, Flanigan teaches the use of terminal blocks that serve to both insulate and seal the bolt. The disadvantage of the Flanigan assembly is that it requires the use of intricately machined terminal blocks to accomplish a leakproof seal.

It is therefore a principal object of this invention to provide an electrical conductor for passing through the housing of a fluid filled motor that is insulated from the housing and utilizes a minimal number of parts.

A further object of this invention is to provide sealing means to prevent leakage from the fluid filled motor through the electrical conductor.

These and other objects will be apparent to those skilled in the art.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed towards an electrical conductor for a fluid filled motor having a housing. The electrical conductor comprises insulating elements received by a passage extending through the housing, and a terminal bolt passing through the insulating elements. The electrical conductor further comprises sealing means between

the terminal bolt, insulating elements, and the housing, and a fastening nut secured to the terminal bolt compressing the sealing means to seal against fluid flow through the passage.

The present invention also is directed towards a method of sealing said electrical conductor through the housing of a fluid filled motor.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded view of an assembled electrical conductor of the present invention;

Fig. 2 is a perspective view of an electrical conductor of the present invention;

Fig. 3 is a cross-sectional view of an electrical conductor passing through the housing of a fluid filled power unit of the present invention;

Fig. 4 is an exploded perspective view of an alternative embodiment of the electrical conductor of the present invention; and

Fig. 5 is a cross-sectional view of an alternative embodiment of the electrical conductor passing through the housing of a fluid filled motor of the present invention.

DESCRIPTION OF THE INVENTION

With reference to the drawings, particularly Figs. 1 and 2, an electrical conductor 10 is shown which comprises a terminal bolt 12 having a bolt head 14 and a threaded portion 16. Terminal bolt 12 preferably is made of copper or brass to improve electrical conductivity.

Insulating elements 18 and 20 insulate the terminal bolt 12 from the motor housing 22 (Fig. 3). Insulating elements 18 and 20 have cylindrical portions 24 and 26 that

are received within the bore 28 of housing 22. Insulating elements 18 and 20 also have flange portions 30 and 32 that engage with housing 22.

Sealing means 34 and 36 are positioned about the terminal bolt 12 and insulating element 18 to form a seal between terminal bolt 12, insulating element 18, and bore 28 in housing 22. Sealing means 34 and 36 are preferably O-rings appropriately sized such that O-ring 34 forms a seal between terminal bolt 12 and insulating element 18 and O-ring 36 forms a seal between insulating element 18 and bore 28. Alternatively, sealing means 34 and 36 may be comprised of resilient washers.

Fastening nut 38 engages with threaded portion 16 of terminal bolt 12 to tighten the electrical conductor 10 about the housing 22 and compress sealing means 34 and 36 to form a seal between terminal bolt 12, insulating element 18, and bore 28. Nut 38 preferably is made of copper or brass to improve the conductivity of the electrical conductor 10.

Wire terminal 40 fits over threaded portion 16 of terminal bolt 12 and engages with Nut 38. Nut 42 is threadably received by terminal bolt 12 to tighten wire terminal 40 firmly against nut 38.

Cables 44 and 46 are attached to the electrical conductor 10 such that electrical power in cable 44 passes through the electrical conductor 10 and is received by cable 46. Specifically, cable 44 is attached to the head 14 of terminal bolt 12 by welding, brazing, or any other conventional method of attachment. Cable 46 is received by wire terminal 40, which is securely fastened to the electrical conductor 10.

In an alternative embodiment, the electrical conductor 10 may include insulating elements 48 and 50, as shown in

Figs. 4 and 5. Insulating element 48 is comprised of a cylindrical portion 52 that is received within the bore 28 of housing 22 and extends the entire length of the bore 28 and protrudes slightly from housing 22. Insulating element 48 also has a flange portion 54 that engages with housing 22. Insulating element 50 comprises a non-metallic washer that has an inner diameter greater than the outer diameter of cylindrical portion 52 of the insulating element 48. Insulating element 50 is received by the end of the cylindrical portion 52 of the insulating element 48 and is tightened against housing 22 by fastening nut 38, as best shown in Fig. 5.

In operation, the electrical conductor 10 is used to pass electrical power through a fluid filled motor housing 22, as shown in Fig. 3. As such, the electrical conductor 10 may be used to provide power to electrical components (not shown) within housing 22. Insulating elements 18 and 20 are inserted within the bore 28 of housing 22, and sealing means 36 provides for a leakproof seal between insulating element 18 and bore 28. Terminal bolt 12 passes through insulating elements 18 and 20, and sealing element 34 provides for a leakproof seal between terminal bolt 12 and insulating element 18. Fastening nut 38 is secured to terminal bolt 12 such that the electrical conductor 10 is tightened about the housing 22 to compress sealing means 34 and 36. Nut 42 secures to terminal bolt 12 to tighten wire terminal 40 against nut 38. Cables 44 and 46 are attached to the electrical conductor 10 such that power from cable 44 flows through the electrical conductor 10 and is received by cable 46. Accordingly, the electrical conductor 10 transfers power from outside of motor housing 22 to

electrical components (not shown) inside without allowing hydraulic fluid to leak through bore 28.

It is therefore seen that by the use of a sealing means, this invention permits an electrical conductor to pass through the housing of a fluid filled motor without leakage.